CURTIS

Motor Controllers

ACF2-T / ACF2-D

Integrated Dual AC Traction and DC Pump Motor Controller

CE

AC F2-T / ACF2-D

The Ultimate Combi Control System: Superb Performance and Value

The Curtis Model AC F2-T integrates three separate motor controllers into a compact, rugged unit. The AC F2-T provides independent control of dual AC induction or PMAC traction motors and control of a DC hydraulic pump motor. Curtis Model AC F2-D provides a dual traction-only version without the DC Pump Control. Both models use dual, high-performance ARM Cortex microprocessors to ensure the highest possible levels of functional safety, while providing highly efficient motor control and flexible system control capabilities.

The AC F2-T and AC F2-D are perfectly suited for electric-traction aerial work platforms and mobile elevating work platforms such as scissor lifts, vertical mast lifts and articulated boom lifts. Both models are also suitable for other dual-drive electric traction applications such as 3-wheel counterbalance forklifts. Models AC F2-T and AC F2-D allow vehicle designers ability to fully define and control the detailed dynamic performance of the electric traction and hydraulic systems, and also provides comprehensive system management and CAN capabilities.

FEATURES

- High-efficiency, field-oriented motor control algorithms.
- Accurate and responsive control of DC hydraulic pump motor speed and current (AC F2-T only).
- Fully programmable proportional valve and load-hold valve drivers for hydraulic system control.
- Compact, rugged housing with very small 'footprint' for its power rating.
- Heavy-duty M6 busbars for motor and battery connectors.
- Sealed, 35-pin AMPseal I/O connector.
- Impervious to most oils, solvents, degreasers and other chemicals often encountered by industrial vehicles.
- IP65 / IP67 environmental protection as per IEC 60529.
- Exceeds latest global conformance requirements for functional safety, electrical safety and EMC.
- CE marked as a programmable safety device.
- UL583 Pending.

Motors

- Two separate 3-phase bridges provide highly efficient, fully independent control of dual AC induction and/or PMAC motors (dependent on installed software).
- Improved motor auto-characterization setup allows simple on-truck pairing with different Induction motor types.
- Comprehensive library of AC motor types stored in controller memory.
- Half-bridge DC pump output provides efficient control of DC series or compound hydraulic motors (AC F2-T only).

FEATURES continued

Get More Out of Your Battery— Regardless of the Technology

- High-efficiency means more of your battery's energy is converted to motor output power.
- Fully configurable over- and under-voltage protection parameters.
- Wide operating voltage range allows use with the latest cell chemistries such as lithium ion.
- Configurable CANbus and VCL allow easy integration with the BMS (Battery Management Systems) typically found on lithium battery packs.

Powerful, High Performance Dual Microprocessors

- The controllers can be operated as a dual system that combines two controllers in a single package, or as two independent controllers. Each system consists of dual-micro architecture and each achieves up to PL=D, category 2 functional safety under EN ISO 13849-1 / EN 1175-1:1998+A1:2010.
- Ultra-fast processor speeds allow highly accurate control and regulation of voltage, frequency and current.
- EN280 compliant.
- Hardware 'ready' for the forthcoming EN 1175:2020.

Customize Your Vehicle with VCL

- The Curtis VCL (Vehicle Control Language) allows Curtis AC motor controllers to perform as the role of manager, eliminating the need for costly, additional system controllers.

Highly Flexible I/O

- All I/O pins are multi-function, and can be configured to provide up to:
  - 3 digital inputs
  - 9 analog inputs
  - 8 output drivers
  - 2 motor temperature sensors
  - 2 quadrature encoder inputs
  - 2 Sine/Cosine position inputs
  - +5V and +12V external power (200mA)

Inertial Measurement Unit (IMU)

- Six-Axis IMU for measurement of orientation, movement and impact detection (optional).

Comprehensive CAN Capabilities

- Fully compliant with CANopen protocol CiA 301.
- Compatible with SAE J1939 and other 29-bit CANbus protocols (with appropriate VCL application software).
- Models available with or without an integrated CAN termination resistor.

Improved Diagnostics

- Integrated, high visibility status LED with simplified flash code sequence for at-a-glance system troubleshooting.
- Thermal cutback, warning, and automatic shutdown provide protection to motor and controller.
- Error logging and fault history tables with CAN Emergency Messages.

CAN-based Programming

- Models AC F2-T and AC F2-D are programmable over the CANbus. This allows simple 'vehicle level' communication with many of the CAN-based service tools used by the major industrial truck manufacturers worldwide.
- Allows use of the Curtis Integrated Toolkit.

SYSTEM ACCESSORIES

Curtis Model 3141

A cost-effective, CAN-based LCD vehicle status display in a rugged 52mm diameter housing is the ideal partner to both AC F2-T and AC F2-D controllers.

- Large, easy-to-read 16-segment format LCD.
- Battery Discharge Indicator, Service (Hours) Counter and Diagnostic/ Message Center functions.
- Sealed to IP65 (IP67 optional).
- 12–48V nominal operating voltage range.
- CE compliant, UL583 recognized component.
- Optional backlight and heater.

CURTIS™ INTEGRATED TOOLKIT

The Curtis Integrated Toolkit

A fully integrated suite of development and diagnostic tools for use on CAN systems using Curtis and other 3rd party CAN-based products. It is comprised of the following tools that run in a shared environment:

- **Launchpad**
  Starting point and project editor.
- **Programmer**
  Used to configure parameters, view monitor values, and view active faults and the fault history.
- **TACT**
  Improved version of the stand-alone oscilloscope/ datalogging tool.
- **VCL Studio**
  Editor and compiler for VCL software.
- **Menu Editor**
  Tool to create and modify programming menus.
- **Package & Flash**
  Downloader tool to load your software into the CAN device.

The Curtis Integrated Toolkit is compatible with many leading USB>CAN interface dongles from Peak, Kvaser, iFAC, Sontheim, etc. Contact your local Curtis Sales office for further information.

MODEL CHART

AC F2-T

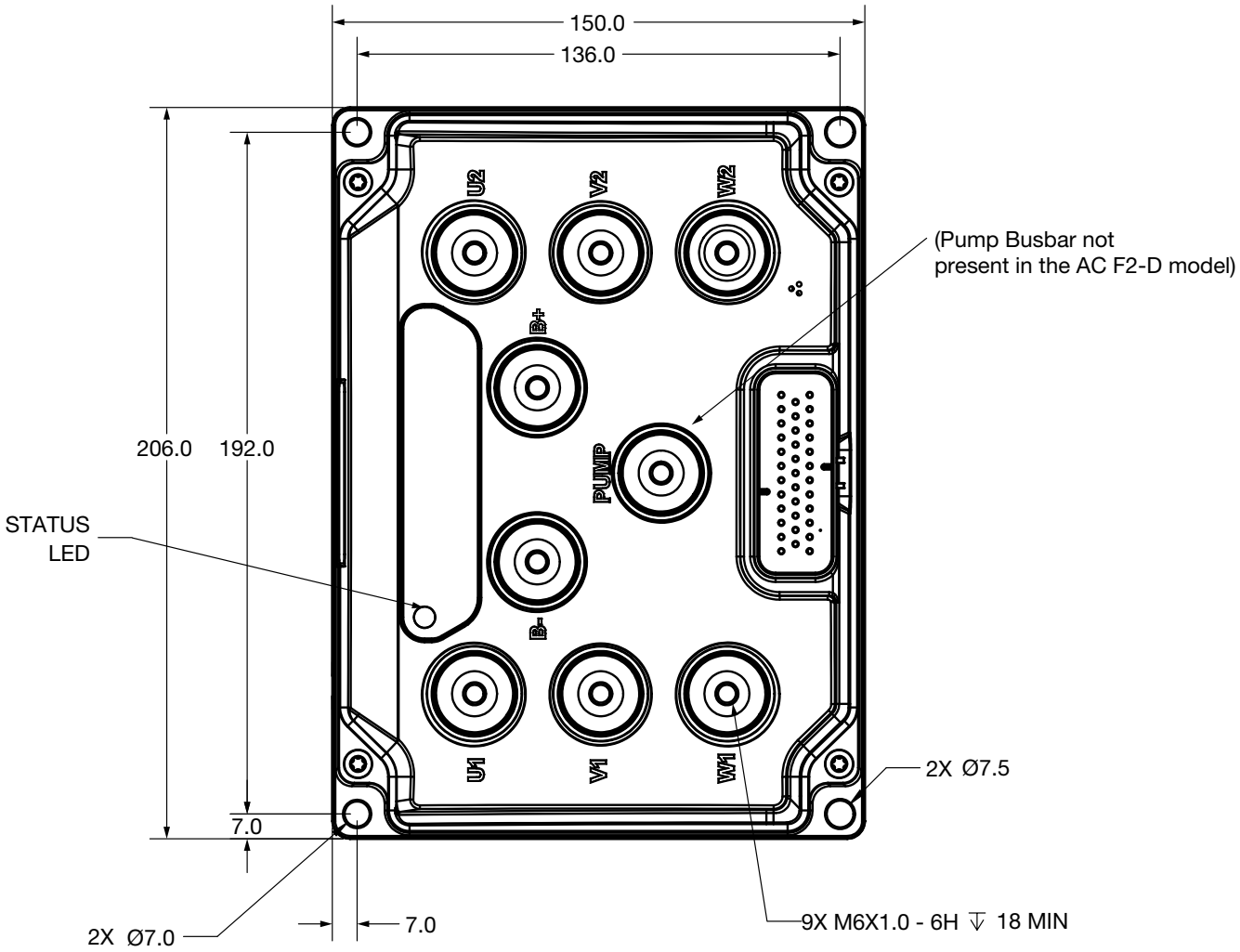
Model Number	Nominal Battery Voltage	Traction Max Current [S2-2 min]	Traction Max Current [S2-60 min]	Pump Max Current
AC F2-T 24-120-240	24V	2x 120Arms	2x 48Arms	240A
AC F2-T 24-200-280	24V	2x 200Arms	2x 80Arms	280A
AC F2-T 48-120-240	48V	2x 120Arms	2x 48Arms	240A
AC F2-T 48-240-240	48V	2x 240Arms	2x 94Arms	240A

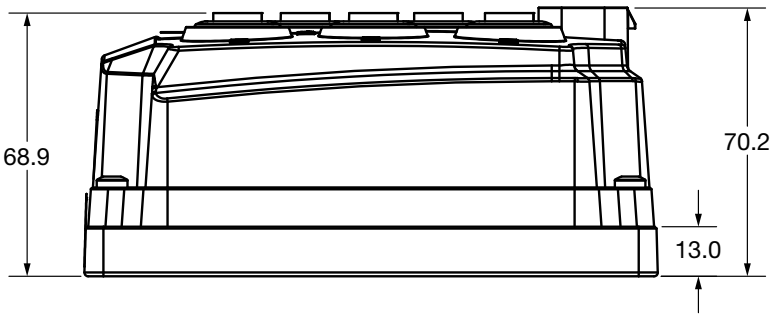
AC F2-D

Model Number	Nominal Battery Voltage	Traction Max Current [S2-2 min]	Traction Max Current [S2-60 min]	Pump Max Current
AC F2-D 24-120	24V	2x 120Arms	2x 48Arms	N/A
AC F2-D 24-200	24V	2x 200Arms	2x 80Arms	N/A
AC F2-D 48-120	48V	2x 120Arms	2x 48Arms	N/A
AC F2-D 48-240	48V	2x 240Arms	2x 94Arms	N/A

DIMENSIONS

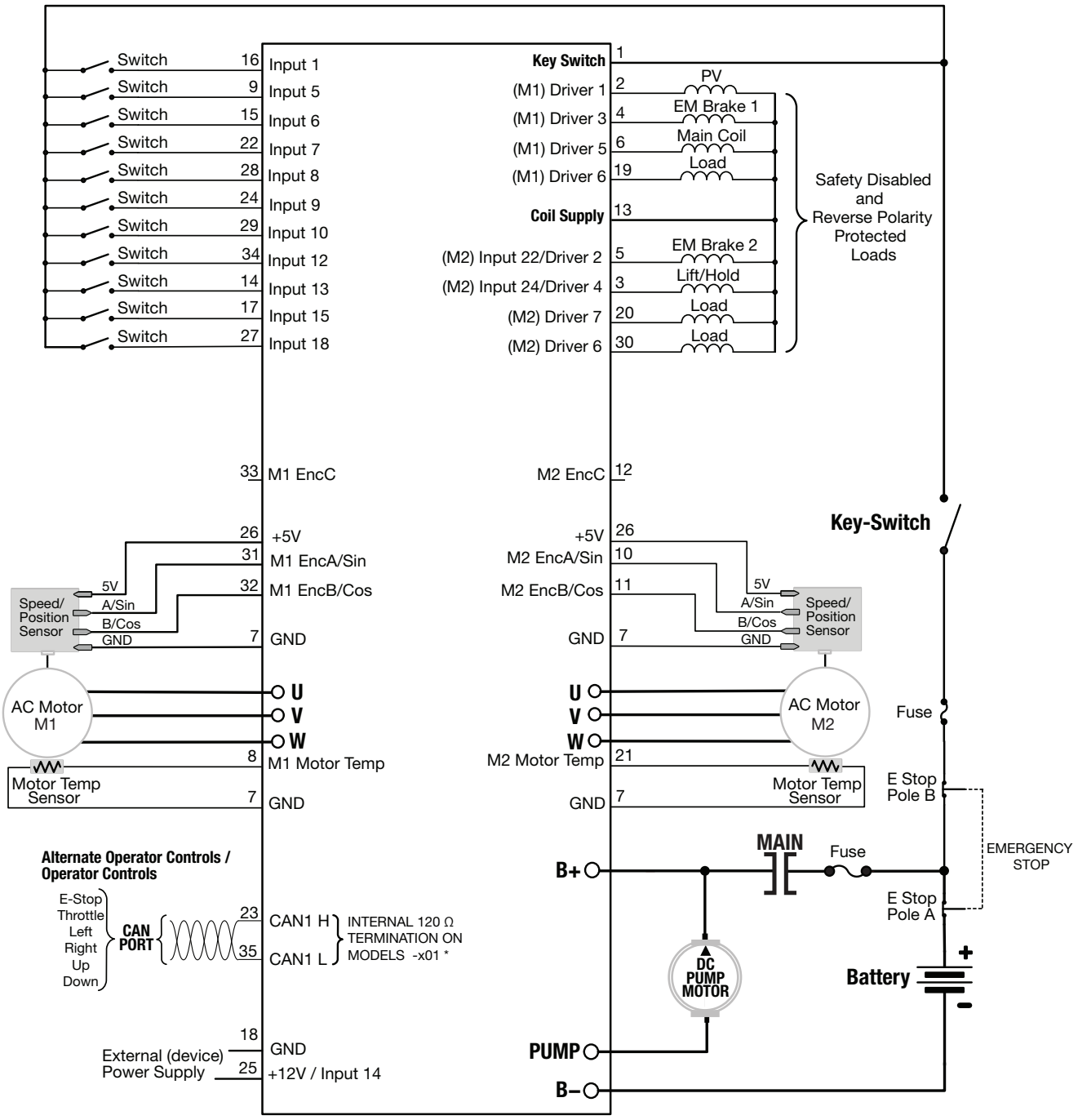
AC F2-T and AC F2-D





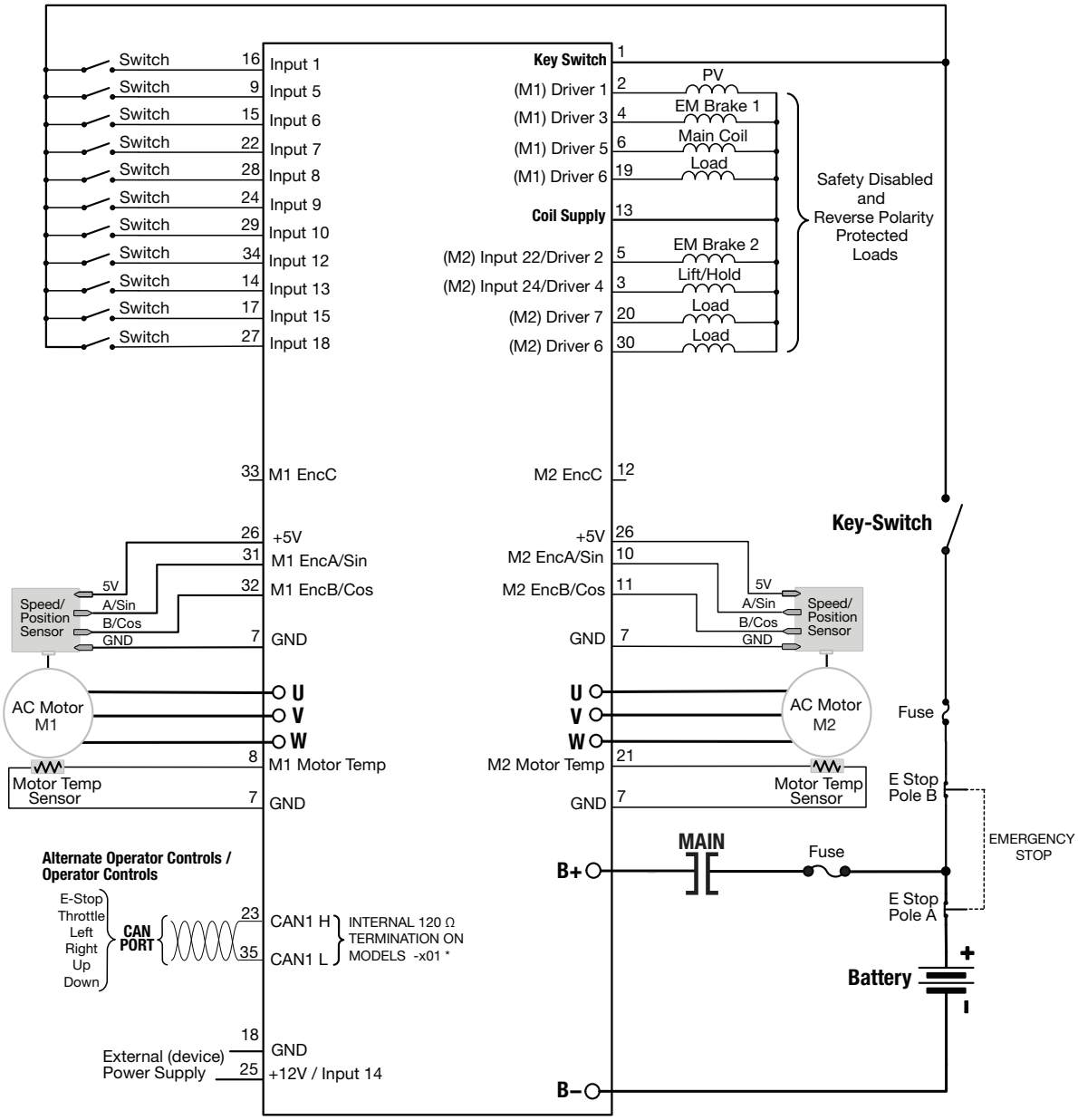
CONNECTOR WIRING

AC F2-T



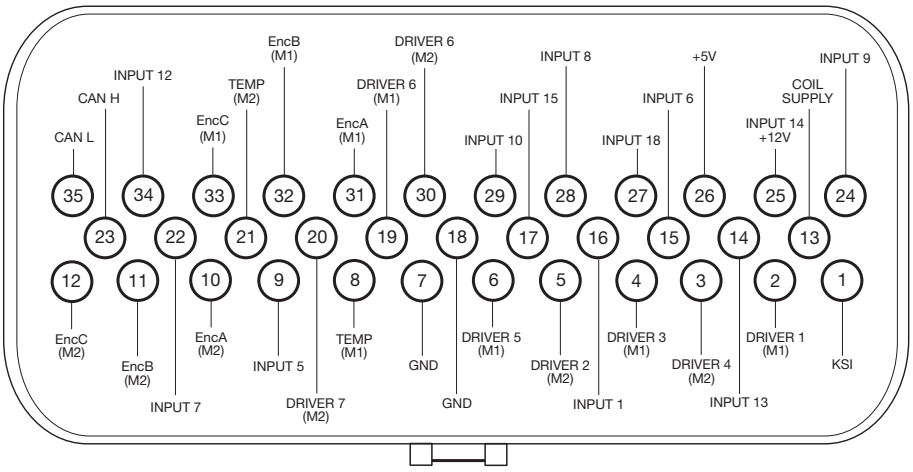
CONNECTOR WIRING

AC F2-D



PINOUT CHART

AC F2-T and AC F2-D



SPECIFICATIONS

Nominal Input Voltage	24V	36V/48V
Undervoltage	12V	18V
Overvoltage	30V	63V
Traction PWM Frequency	10kHz	
Pump PWM Frequency	18kHz	
Maximum Controller Output Frequency	599Hz	
Electrical Isolation to Heatsink	500Vac	
Storage Ambient Temperature	–40°C to 95°C	
Operating Ambient Temperature	–40°C to 50°C	
Traction Thermal Cutback	Controller linearly reduces maximum current limit with an internal heatsink temperature from 85°C (185°F) to 95°C (203°F); complete cutoff occurs above 95°C (203°F) and below –40°C (–40°F).	
Design Life	8000 hours	
Package Environmental Rating	IP65/IP67	
Weight	1.5kg (3.3lbs)	
Dimensions W x L x H	206mm x 150mm x 70mm	
EMC	Designed to the requirements of EN 12895:2015	
Safety	Designed to the requirements of EN1175-1:1998+A1: 2010, EN ISO 13849-1:2015 and EN280	
UL	UL583 Pending	

WARRANTY Two year limited warranty from time of delivery.

The Curtis Difference
You feel it when you drive it

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